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Digital Computer Laboratory  
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SUBJECT: SOME NOTES ON CURRENT TUBE TYPES

To: All Division 6 Engineers and Technicians

From: H. B. Frost

Date: May 4, 1953

Abstract: Numerous tubes with RTMA 4-digit type numbers are in current use on this project. In many cases receiving-type tubes have been replaced by these newer types, with resultant confusion. A list of equivalents has been prepared to clarify this situation.

Some tube types, in particular the 715C, are either obsolete or unsatisfactory and should not be used in new design.

Many of the tubes now in the laboratory have type numbers of the RTMA 5500 series. In many cases, these tubes represent improvements on standard receiving tubes with old familiar numbers and may be substituted directly for such tubes without circuit changes. However, a certain amount of confusion has resulted from the use of the newer tubes in sockets numbered for the prototype types. Such confusion is perpetuated through parts lists, drawings, and the master bill of materials for the WWI computer.

A list of tubes with essentially equivalent electrical characteristics has been prepared to clarify the situation. These are arranged in order of the receiving tube numbers, with equivalents described briefly. Parts lists should specify the tube which will be used in the circuit, not the prototype tube. Obsolete tubes or types not recommended should not be used in new designs.

OB2 The 6074 is a premium version of the OB2, made by RCA. This type will be placed in service when present stocks of OB2's are depleted. The 6074 should be specified for new designs.

2C51 The 5670 is the ARINC version of the 2C51, made by G.E. and Raytheon. While the 5670 is considerably better than the 2C51, the close spacings inherent in this type make it undesirable for new equipment to be used in digital computers.

6AS6 The 5725 is the ARINC version of the 6AS6, and it is made by both G.E. and Raytheon. This tube will be used for replacements only, as no active designs have been made using the 6AS6 for some years in this laboratory.

6AS7G The 6080 is a redesign of the 6AS7G, with changes in the envelope and the press, but without major changes in the structures. As a result, while the 6080 is somewhat better than the 6AS7G as far as structural rigidity is concerned, the improvement is not great. The 6080WA is reputed to be

considerably improved structurally; this type remains to be evaluated here. In the absence of a better tube, the 6080 remains the recommended series regulator tube.

6AK5 The 5654 is the ARINC version of the 6AK5; it is made by G.E., RCA, and Raytheon. It is much more reliable than the 6AK5 and has very few rejects on initial test. It is presently used in the radio-frequency amplifiers for storage-tube readout, where it is fairly satisfactory. However, the very close spacings inherent in this tube make it undesirable for new equipment which will be placed within computer loops.

6AU6 The 6136 is a G.E. premium version of the 6AU6 and is made on the same lines as the ARINC tubes. It will be used both for replacement purposes and for new designs. Initial tests show very satisfactory performance, but no life data is available as yet.

6J6 The 5964 is a computer version of the 6J6, made by RCA. It has the same structure as the 6J6 and while it is an improvement, it is not entirely satisfactory for critical designs. The 5844 is a replacement for the 6J6 in IBM 604 circuits, where only 0.5 watt of anode dissipation is needed. The 5844 is made by G.E., and it is very satisfactory, according to IBM. However, the low anode dissipation is a serious limitation.

6L6G The 5881 is a Tung-Sol premium version of the 6L6G. It is a complete redesign with the same electrical characteristics. Tung-Sol claims considerable margin for overload and very good life in some critical circuits. It is being used to replace 6L6G and 6L6GA tubes in WWI and test equipment as failures occur. This replacement will be carried to completion unless some unexpected defect which causes troubles in our circuits is found in the 5881.

7AD7 The 6145 is a special version of the 7AD7, made by Sylvania for this project. It has somewhat higher capacities, higher transconductance, and better cutoff than the 7AD7, along with a higher level of plate current and a passive cathode. This tube design is not yet completely frozen, and mechanical changes to make it more rugged are likely. SR 1407 is a developmental number which was assigned to this tube prior to RTMA registration.

12AT7 The 6201 is a G.E. premium version of the 12AT7. Some of these tubes are now on order. They will be evaluated as to improvements over the 12AT7. It is very probable that 6201 tubes will be used to replace defective 12AT7 tubes in test equipment sockets.

12AU7 The 5963 is an RCA computer version of the 12AU7. These 5963's are now being used in all new equipment designed for the 12AU7 and as replacements for 12AU7's in old equipment. It is more satisfactory than the 12AU7, but it is still somewhat prone to develop interface impedance. There is an ARINC version of the 12AU7 available in the 5814, made by G.E. and Raytheon. However, the 5814 requires more heater current than the 12AU7; hence, it is not a universal replacement. The 5814 has not yet been tried here.

12AY7 The 12AY7 is a G.E. tube designed for low-level audio amplifiers. It was used in the design of the amplifiers for the magnetic tape readout equipment. However, the 12AY7 uses an active cathode, which has three bad effects, namely high interface impedance, high flicker noise, and high

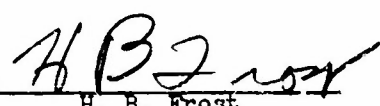
leakage noise. As a result, all 12AY7's in critical circuits have been replaced by 6072's. The 6072 is a premium version of the 12AY7 made also by G.E. Initial life results so far have been very satisfactory. In our application the higher heater current is not a disadvantage.

Certain additional tube types which have no receiving tube prototypes have considerable current interest.


715C Recent events have shown that the 715C is considered obsolete. It is being made at present by only one small company. Since it has not been a very satisfactory tube in critical applications, it should not be used in any new designs. Evaluations has shown that the 4PR60A, which will replace the 715C in its major pulse applications, is not satisfactory for our use because of excessive secondary emission from the plate with no adequate suppression. The 4X150A, which is a UHF tetrode made by EIMAC, is a possible replacement for the 715C. Additional evaluations and life tests remain to be made. The 4X150A has an external anode and requires forced-air cooling for proper operations, besides requiring an entirely different socket.

5651 Until recent years most regulated power supplies used voltage regulator tubes for reference purposes. Voltage regulator tubes require an excess amount of current for this application, and they are not sufficiently stable. The 5651 is a tube especially designed as a voltage reference and should be used for this purpose whenever possible in regulator design.

5965 The 5965 is a twin-triode developed for IBM by G.E., primarily for use in the 701 calculators. The 5965 will serve as the electrical prototype for a general-purpose twin-triode to be used in WWII. It is therefore desirable that the 5965 be used in those applications where a twin-triode of its characteristics is needed.

Signed: 

H. B. Frost

Approved: 

Hugh Wainwright

HBF:ap

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